



# TS4162

## VHF Band Low-Noise Amplifier and OSC Applications

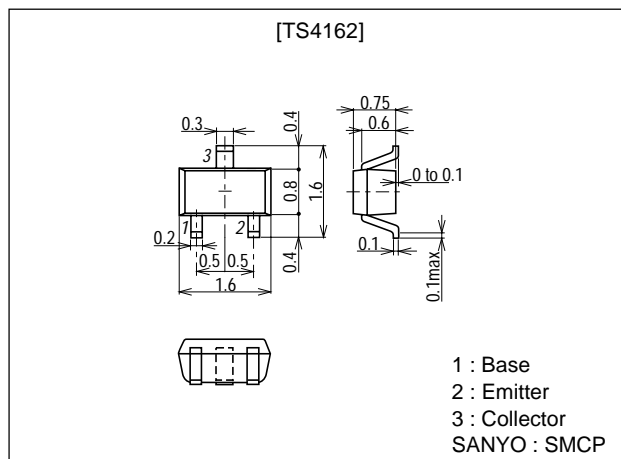
### Features

- Low noise :  $NF=1.8\text{dB}$  typ ( $f=150\text{MHz}$ ).
- High gain :  $|S_{21e}|^2=16\text{dB}$  typ ( $f=150\text{MHz}$ ).
- Ultrasmall package facilitates miniaturization in end products

### Package Dimensions

unit:mm

2106A



### Specifications

#### Absolute Maximum Ratings at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings	Unit
Collector-to-Base Voltage	$V_{CBO}$		20	V
Collector-to-Emitter Voltage	$V_{CEO}$		12	V
Emitter-to-Base Voltage	$V_{EBO}$		2	V
Collector Current	$I_C$		50	mA
Collector Dissipation	$P_C$		100	mW
Junction Temperature	$T_J$		150	$^\circ\text{C}$
Storage Temperature	$T_{stg}$		-55 to +150	$^\circ\text{C}$

#### Electrical Characteristics at $T_a = 25^\circ\text{C}$

Parameter	Symbol	Conditions	Ratings			Unit
			min	typ	max	
Collector Cutoff Current	$I_{CBO}$	$V_{CB}=10\text{V}, I_E=0$			1.0	$\mu\text{A}$
Emitter Cutoff Current	$I_{EBO}$	$V_{EB}=1\text{V}, I_C=0$			10	$\mu\text{A}$
DC Current Gain	$h_{FE} 1$	$V_{CE}=2\text{V}, I_C=3\text{mA}$	80		200	
	$h_{FE} 2$	$V_{CE}=2\text{V}, I_C=50\text{mA}$	70			
Gain-Bandwidth Product	$f_T$	$V_{CE}=2\text{V}, I_C=3\text{mA}$	1.0	1.7		GHz
Output Capacitance	$C_{ob}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		1.1	1.8	pF
Reverse Transfer Capacitance	$C_{re}$	$V_{CB}=10\text{V}, f=1\text{MHz}$		0.8		pF
Forward Transfer Gain	$ S_{21e} ^2$	$V_{CE}=2\text{V}, I_C=3\text{mA}, f=150\text{MHz}$	13	16		dB
Noise Figure	NF	$V_{CE}=2\text{V}, I_C=3\text{mA}, f=150\text{MHz}$		1.8	3.0	dB

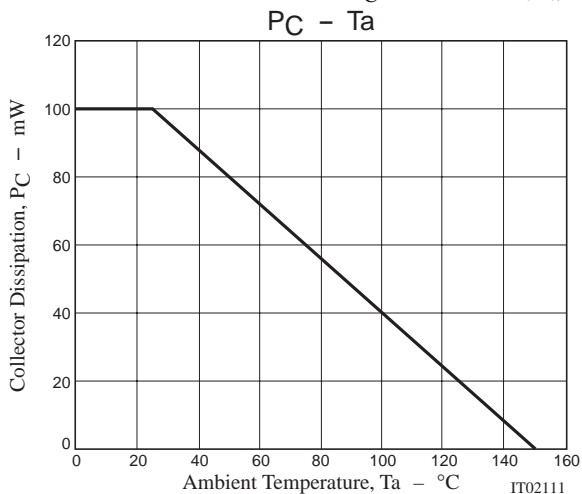
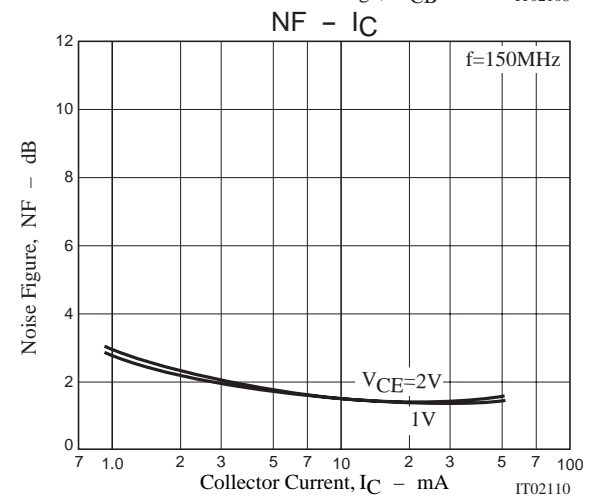
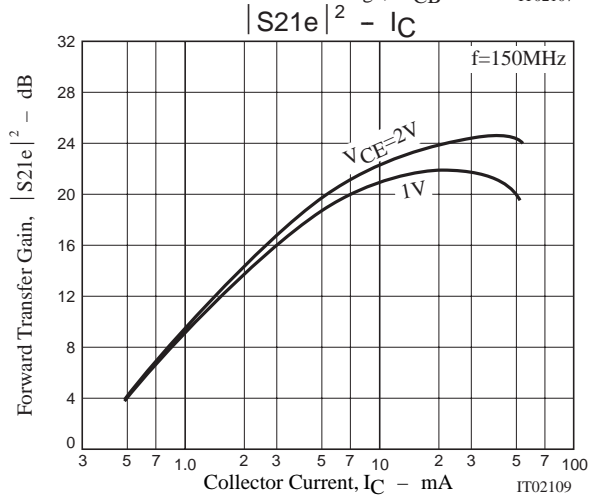
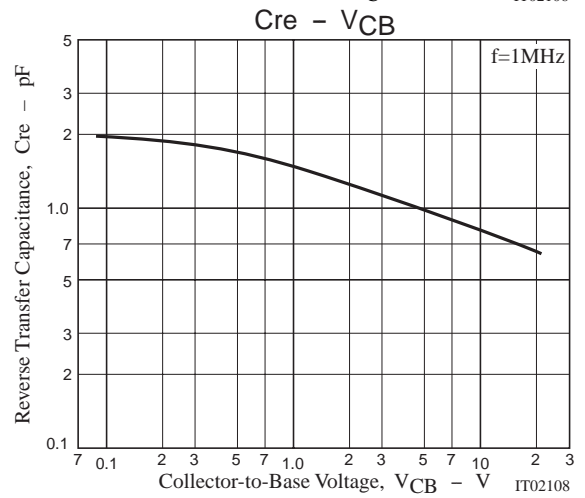
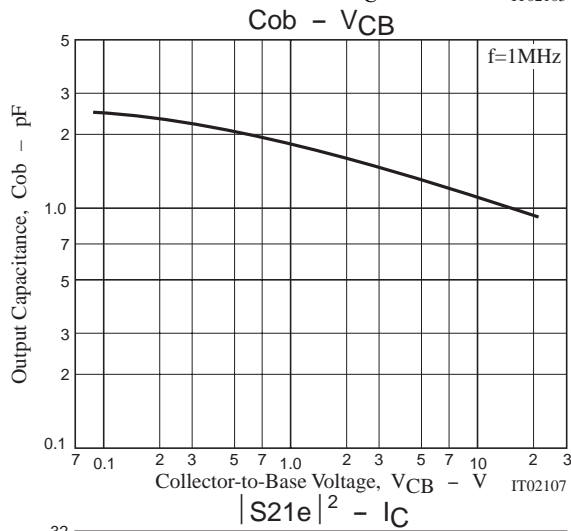
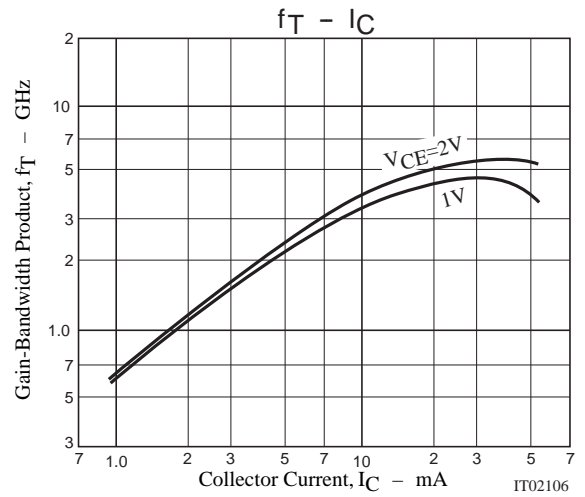
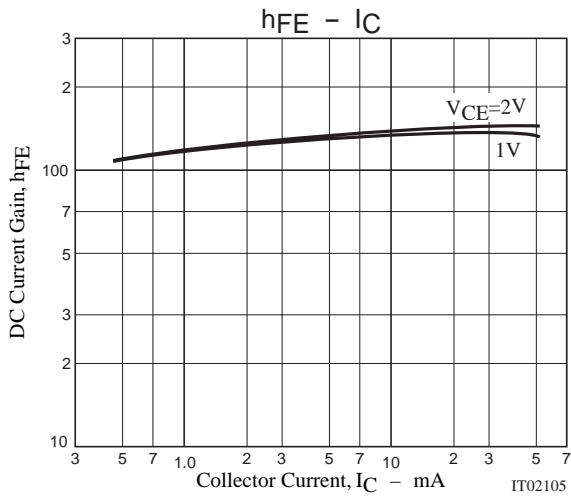
Marking : MA

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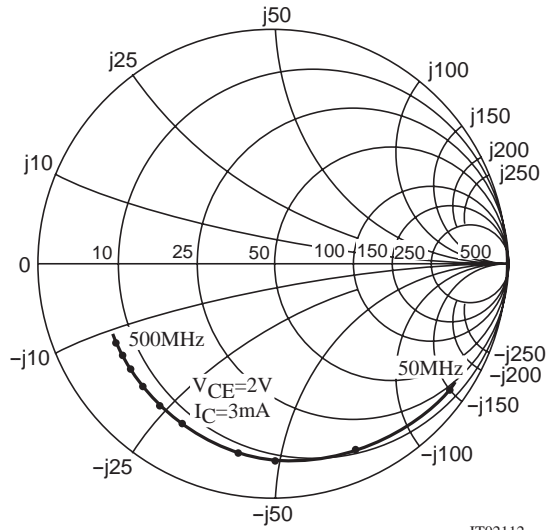
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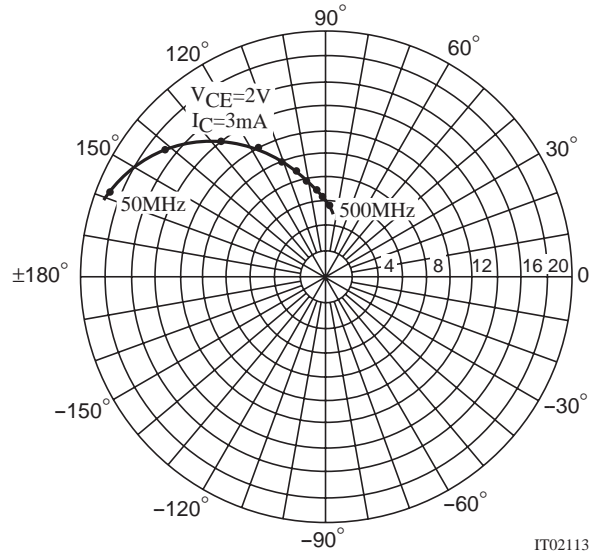


## S parameter [Tr1]

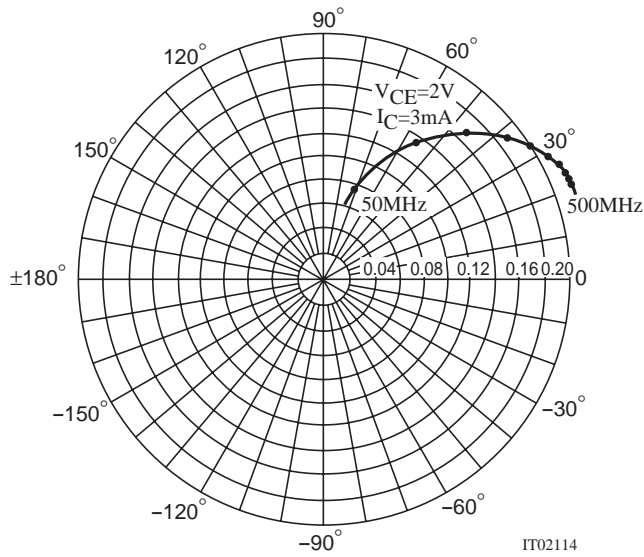
S11e  
f=50 to 500MHz(50MHz Step)



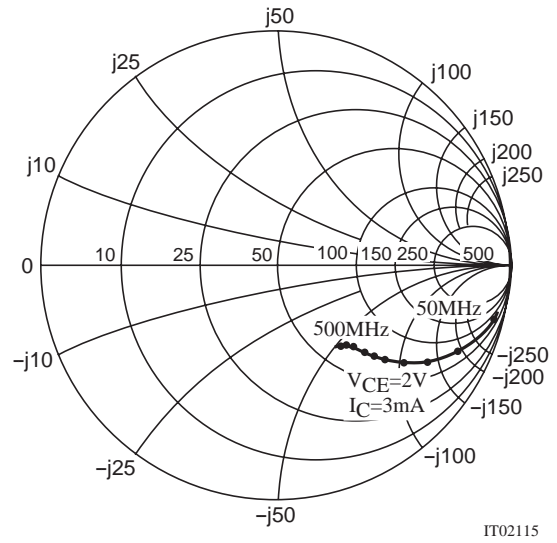
S21e  
f=50 to 500MHz(50MHz Step)



S12e  
f=50 to 500MHz(50MHz Step)



S22e  
f=50 to 500MHz(50MHz Step)



## S Parameters (Common emitter)

$V_{CE}=2V$ ,  $I_C=1mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.965	-25.6	3.48	163.7	0.040	75.3	0.985	-7.1
100	0.948	-49.3	3.30	149.2	0.075	62.8	0.951	-13.3
150	0.922	-69.5	2.96	136.6	0.101	51.8	0.907	-18.0
200	0.903	-86.0	2.65	126.3	0.119	42.9	0.859	-21.7
250	0.885	-99.4	2.33	117.3	0.131	35.9	0.819	-24.6
300	0.873	-110.4	2.07	110.1	0.139	30.1	0.791	-26.9
350	0.866	-119.4	1.89	103.8	0.145	25.4	0.778	-28.7
400	0.854	-127.4	1.73	97.8	0.147	21.2	0.753	-30.8
450	0.846	-133.9	1.58	92.9	0.148	17.7	0.742	-32.7
500	0.847	-138.9	1.44	88.5	0.148	15.0	0.736	-34.4

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$V_{CE}=2V$ ,  $I_C=3mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.909	-35.9	9.43	158.4	0.038	71.0	0.949	-14.8
100	0.873	-66.2	8.30	141.0	0.067	56.0	0.849	-26.1
150	0.836	-89.8	7.03	127.6	0.084	44.9	0.744	-33.4
200	0.815	-106.3	5.94	117.9	0.095	37.5	0.658	-38.0
250	0.794	-119.1	5.05	110.4	0.100	32.4	0.590	-41.4
300	0.784	-128.7	4.36	104.3	0.104	28.7	0.550	-43.2
350	0.779	-136.3	3.90	99.4	0.107	26.0	0.518	-44.7
400	0.769	-143.1	3.46	94.8	0.108	23.9	0.493	-45.8
450	0.767	-148.1	3.13	91.3	0.108	22.4	0.474	-47.2
500	0.766	-152.1	2.83	87.8	0.108	21.7	0.463	-48.5

$V_{CE}=2V$ ,  $I_C=10mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.775	-61.9	23.54	145.3	0.033	61.4	0.836	-34.4
100	0.731	-101.2	17.31	124.8	0.048	46.5	0.624	-55.2
150	0.709	-124.3	13.06	112.7	0.056	39.6	0.481	-67.0
200	0.704	-136.7	10.22	105.5	0.060	37.1	0.387	-75.8
250	0.695	-146.3	8.43	100.2	0.064	36.5	0.335	-80.4
300	0.695	-152.6	7.09	96.2	0.066	36.8	0.296	-85.3
350	0.695	-157.6	6.21	92.7	0.070	37.2	0.270	-87.4
400	0.694	-162.0	5.45	89.8	0.072	38.5	0.245	-91.4
450	0.696	-164.9	4.84	87.5	0.075	39.9	0.231	-95.3
500	0.694	-167.7	4.39	85.0	0.078	41.5	0.222	-97.9

$V_{CE}=2V$ ,  $I_C=30mA$ ,  $Z_O=50\Omega$

Freq (MHz)	$ S_{11} $	$\angle S_{11}$	$ S_{21} $	$\angle S_{21}$	$ S_{12} $	$\angle S_{12}$	$ S_{22} $	$\angle S_{22}$
50	0.647	-98.6	37.50	129.9	0.024	52.4	0.665	-61.6
100	0.657	-134.1	22.96	111.5	0.032	44.8	0.448	-90.7
150	0.663	-149.5	16.09	103.0	0.037	44.8	0.353	-107.8
200	0.665	-157.6	12.33	97.8	0.041	47.3	0.308	-119.8
250	0.664	-163.2	9.95	94.3	0.046	49.5	0.286	-128.1
300	0.667	-167.3	8.35	91.3	0.051	52.2	0.271	-133.9
350	0.669	-170.2	7.23	89.0	0.055	54.0	0.258	-138.9
400	0.672	-173.0	6.33	86.9	0.060	55.9	0.253	-143.4
450	0.670	-174.9	5.64	85.1	0.066	57.2	0.251	-146.5
500	0.671	-176.6	5.08	83.3	0.071	58.3	0.250	-148.4

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